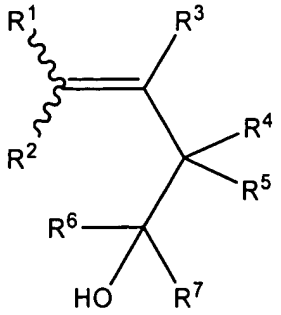
WE CLAIM:

1. An alkene fluoroalkanol having the structure of formula (III)

(III) 

wherein:

R^1 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_1-C_{24} alkoxy, and substituted C_1-C_{24} alkoxy;

R^2 is selected from hydrogen, C_1-C_{24} alkyl and substituted C_1-C_{24} alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_{24} alkyl, and substituted C_1-C_{24} alkyl, and further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a ring;

R^{6A} is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, and -(CO)-R in which R is hydrogen, hydroxyl, halo, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, amino, C_1-C_{24} alkylamino, or di(C_1-C_{24} alkyl)amino; and

R^{7A} is C_1-C_{24} alkyl or substituted C_1-C_{24} alkyl, and further wherein R^{6A} and R^{7A} may be taken together to form a ring, with the proviso that at least one of R^{6A} and R^{7A} is fluorinated.

2. The alkene fluoroalkanol of claim 1, wherein:

R^1 is selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} hydroxyalkyl, fluorinated C_1-C_{12} alkyl, fluorinated C_3-C_{12} hydroxyalkyl, fluorinated C_3-C_{12} alkyl substituted with a protected hydroxyl group, and C_1-C_{12} alkoxy;

R^2 is selected from hydrogen, C_1-C_{12} alkyl, and substituted C_1-C_{12} alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} hydroxyalkyl, fluorinated C_1-C_{12} alkyl, fluorinated C_1-C_{12} hydroxyalkyl, and fluorinated C_1-C_{12} alkyl substituted with a protected hydroxyl group, and further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{30} alicyclic group;

R^{6A} is selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} haloalkyl, and carboxyl; and

R^{7A} is C_1-C_{12} alkyl or fluorinated C_1-C_{12} alkyl.

3. The alkene fluoroalkanol of claim 2, wherein:

R^1 is selected from hydrogen, C_1-C_8 alkyl, C_1-C_8 alkoxy, and fluorinated hydroxyalkyl having the structure $-(L^1)_{n1}-CR^8R^9-OH$ in which n1 is zero or 1, L^1 is C_1-C_6 aliphatic, R^8 is selected from hydrogen, C_1-C_8 alkyl, and fluorinated C_1-C_8 alkyl, and R^9 is fluorinated C_1-C_8 alkyl;

R^2 is hydrogen or C_1-C_8 alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_8 alkyl, and fluorinated hydroxyalkyl having the structure $-(L^2)_{n2}-CR^{8A}R^{9A}-OH$ in which n2 is zero or 1, L^2 is C_1-C_6 aliphatic, R^{8A} is selected from hydrogen, C_1-C_8 alkyl, and fluorinated C_1-C_8 alkyl, and R^{9A} is

fluorinated C_1-C_8 alkyl, and further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{18} alicyclic group;

R^{6A} is selected from hydrogen, C_1-C_8 alkyl, and fluorinated C_1-C_8 alkyl; and

R^{7A} is C_1-C_8 alkyl or fluorinated C_1-C_8 alkyl.

4. The alkene fluoroalkanol of claim 3, wherein:

R^1 is selected from hydrogen, C_1-C_4 alkyl, C_1-C_4 alkoxy, and $-(L^1)_{n1}-CR^8R^9-OH$ in which n1 is zero or 1, L^1 is C_1-C_4 aliphatic, R^8 is selected from hydrogen, methyl, trifluoromethyl, difluoromethyl, and fluoromethyl, and R^9 is selected from methyl, trifluoromethyl, difluoromethyl, and fluoromethyl;

R^2 is hydrogen or C_1-C_4 alkyl;

R^3, R^4, and R^5 are independently selected from hydrogen, C_1-C_4 alkyl, and $-(L^2)_{n2}-CR^{8A}R^{9A}-OH$ in which n2 is zero or 1, L^2 is C_1-C_4 aliphatic, R^{8A} is selected from hydrogen, methyl, trifluoromethyl, difluoromethyl, and fluoromethyl, and R^{9A} is selected from methyl, trifluoromethyl, difluoromethyl, and fluoromethyl, and further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{12} alicyclic group;

R^{6A} is selected from hydrogen, C_1-C_4 alkyl, semi-fluorinated C_1-C_4 alkyl, and perfluorinated C_1-C_4 alkyl; and

R^{7A} is selected from C_1-C_4 alkyl, semi-fluorinated C_1-C_4 alkyl, and perfluorinated C_1-C_4 alkyl.

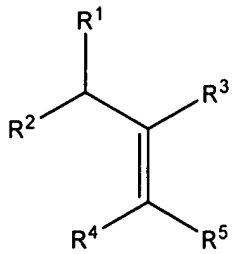
5. The alkene fluoroalkanol of claim 4, wherein R^{6A} and R^{7A} are both trifluoromethyl.

6. The alkene fluoroalkanol of claim 4, wherein one of R^{6A} and R^{7A} is methyl and the other is trifluoromethyl.

7. A method for synthesizing an alkene fluoroalkanol, comprising contacting (a) an olefinic reactant directly substituted on an olefinic carbon atom with a substituted or unsubstituted methyl group with (b) an asymetrically substituted fluorinated ketone, under reaction conditions and for a time period effective to allow addition of the olefinic reactant to the carbonyl carbon of the fluorinated ketone.

8. The method of claim 7, wherein the substituted or unsubstituted methyl group is of the formula $-CHR^1R^2$, such that the olefinic reactant has the structure of formula (I)

(I)



wherein:

R^1 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_1-C_{24} alkoxy, and substituted C_1-C_{24} alkoxy;

R^2 is selected from hydrogen, C_1-C_{24} alkyl and substituted C_1-C_{24} alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_{24} alkyl, and substituted C_1-C_{24} alkyl; and

further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a ring.

9. The method of claim 8, wherein:

R^1 is selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} hydroxyalkyl, fluorinated C_1-C_{12} alkyl, fluorinated C_1-C_{12} hydroxyalkyl, fluorinated C_1-C_{12} alkyl substituted with a protected hydroxyl group, and C_1-C_{12} alkoxy;

R^2 is selected from hydrogen, C_1-C_{12} alkyl, and substituted C_1-C_{12} alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} hydroxyalkyl, fluorinated C_1-C_{12} alkyl, fluorinated C_1-C_{12} hydroxyalkyl, and fluorinated C_1-C_{12} alkyl substituted with a protected hydroxyl group; and

further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{30} alicyclic group.

10. The method of claim 9, wherein:

R^1 is selected from hydrogen, C_1-C_8 alkyl, C_1-C_8 alkoxy, and fluorinated hydroxyalkyl having the structure $-(L^1)_{n1}-CR^8R^9-OH$ in which n1 is zero or 1, L^1 is C_1-C_6 aliphatic, R^8 is selected from hydrogen, C_1-C_8 alkyl, and fluorinated C_1-C_8 alkyl, and R^9 is fluorinated C_1-C_8 alkyl;

R^2 is hydrogen or C_1-C_8 alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_8 alkyl, and fluorinated hydroxyalkyl having the structure $-(L^2)_{n2}-CR^{8A}R^{9A}-OH$ in which n2 is zero or 1, L^2 is C_1-C_6 aliphatic, R^{8A} is selected from hydrogen, C_1-C_8 alkyl, and fluorinated C_1-C_8 alkyl, and R^{9A} is fluorinated C_1-C_8 alkyl; and

further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{18} alicyclic group.

11. The method of claim 10, wherein:

R^1 is selected from hydrogen, C_1-C_4 alkyl, C_1-C_4 alkoxy, and $-(L^1)_{n1}-CR^8R^9-OH$ in which n1 is zero or 1, L^1 is C_1-C_4 aliphatic, R^8 is selected from hydrogen, methyl, trifluoromethyl, difluoromethyl, and fluoromethyl, and R^9 is selected from methyl, trifluoromethyl, difluoromethyl, and fluoromethyl;

R^2 is hydrogen or C_1-C_4 alkyl;

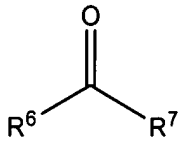
R^3, R^4, and R^5 are independently selected from hydrogen, C_1-C_4 alkyl, and $-(L^2)_{n2}-CR^{8A}R^{9A}-OH$ in which n2 is zero or 1, L^2 is C_1-C_4 aliphatic, R^{8A} is selected from hydrogen, methyl, trifluoromethyl, difluoromethyl, and fluoromethyl, and R^{9A} is selected from methyl, trifluoromethyl, difluoromethyl, and fluoromethyl; and

further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{12} alicyclic group.

12. The method of claim 11, wherein the olefinic reactant is selected from isobutylene, pinene, butenyl methyl ether, isopropenyl methyl ether, *exo*-2-methylene

norbornane, 5-vinyl-2-norbornene, *exo*-methylene cyclopentane, and *exo*-methylene cyclohexane.

13. The method of claim 7, wherein the fluorinated ketone has the structure of formula (II)

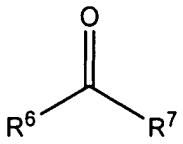
(II) 

wherein:

R^6 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_3-C_{25} acylmethyl, (fluorinated C_2-C_{24} acyl)-substituted methyl, (fluorinated C_2-C_{24} acyl)-substituted difluoromethyl, and -(CO)-R in which R is hydrogen, hydroxyl, halo, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, amino, C_1-C_{24} alkylamino, or di(C_1-C_{24} alkyl)amino; and

R^7 is C_1-C_{24} alkyl or fluorinated C_1-C_{24} alkyl, with the provisos that R^6 and R^7 are different or taken together to form a ring, and at least one of R^6 and R^7 is fluorinated.

14. The method of claim 8, wherein the fluorinated ketone has the structure of formula (II)

(II) 

wherein:

R^6 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_3-C_{25} acylmethyl, (fluorinated C_2-C_{24} acyl)-substituted methyl, (fluorinated C_2-C_{24} acyl)-substituted difluoromethyl, and -(CO)-R in which R is hydrogen, hydroxyl, halo, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, amino, C_1-C_{24} alkylamino, or di(C_1-C_{24} alkyl)amino; and

R^7 is C_1-C_{24} alkyl or fluorinated C_1-C_{24} alkyl, with the provisos that R^6 and R^7 are different or taken together to form a ring, and at least one of R^6 and R^7 is fluorinated.

15. The method of claim 14, wherein R^6 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_3-C_{25} acylmethyl, (fluorinated C_2-C_{24} acyl)-substituted methyl, and (fluorinated C_2-C_{24} acyl)-substituted difluoromethyl.

16. The method of claim 15, wherein:

R^6 is selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} haloalkyl, C_3-C_{13} acylmethyl, (fluorinated C_2-C_{12} acyl)-substituted methyl, and (fluorinated C_2-C_{12} acyl)-substituted difluoromethyl; and

R^7 is C_1-C_{12} alkyl or fluorinated C_1-C_{12} alkyl.

17. The method of claim 16, wherein:

R^6 is selected from hydrogen, C_1-C_8 alkyl, fluorinated C_1-C_8 alkyl, C_3-C_9 acylmethyl, (fluorinated C_2-C_8 acyl)-substituted methyl, and (fluorinated C_2-C_8 acyl)-substituted difluoromethyl; and

R^7 is C_1-C_8 alkyl or fluorinated C_1-C_8 alkyl.

18. The method of claim 17, wherein:

R^6 is selected from hydrogen, C_1-C_4 alkyl, semi-fluorinated C_1-C_4 alkyl, perfluorinated C_1-C_4 alkyl, and R^{12}-(CO)-$CR^{10}R^{11}$- in which R^{10} and R^{11} are H or F and R^{12} is methyl or trifluoromethyl; and

R^7 is selected from C_1-C_4 alkyl, semi-fluorinated C_1-C_4 alkyl, and perfluorinated C_1-C_4 alkyl.

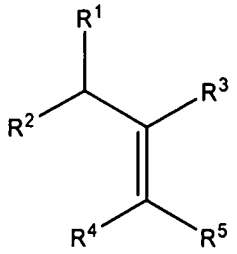
19. The method of claim 18, wherein one of R^6 and R^7 is methyl and the other is trifluoromethyl.

20. The method of claim 18, wherein R^6 is R^{12}-(CO)-$CR^{10}R^{11}$-.

21. The method of claim 20, wherein the fluorinated ketone is selected from trifluoroacetylacetone and hexafluoroacetylacetone.

22. A method for synthesizing an alkene fluoroalkanol, comprising contacting (a) an olefinic reactant directly substituted on an olefinic carbon atom with a substituted or unsubstituted methyl group with (b) a fluorinated carbonyl compound under reaction conditions and for a time period effective to allow addition of the olefinic reactant to the carbonyl carbon of the fluorinated carbonyl compound, with the proviso that the fluorinated carbonyl compound is other than hexafluoroacetone.

23. The method of claim 22, wherein the substituted or unsubstituted methyl group is of the formula $-CHR^1R^2$, such that the olefinic reactant has the structure of formula (I)

(I) 

wherein:

R^1 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_1-C_{24} alkoxy, and substituted C_1-C_{24} alkoxy;

R^2 is selected from hydrogen, C_1-C_{24} alkyl and substituted C_1-C_{24} alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_{24} alkyl, and substituted C_1-C_{24} alkyl; and

further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form an alicyclic group.

24. The method of claim 23, wherein:

R^1 is selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} hydroxyalkyl, fluorinated C_1-C_{12} alkyl, fluorinated C_1-C_{12} hydroxyalkyl, fluorinated C_1-C_{12} alkyl substituted with a protected hydroxyl group, and C_1-C_{12} alkoxy;

R^2 is selected from hydrogen, C_1-C_{12} alkyl, and substituted C_1-C_{12} alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} hydroxyalkyl, fluorinated C_1-C_{12} alkyl, fluorinated C_1-C_{12} hydroxyalkyl, and fluorinated C_1-C_{12} alkyl substituted with a protected hydroxyl group; and

further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{30} alicyclic group.

25. The method of claim 24, wherein:

R^1 is selected from hydrogen, C_1-C_8 alkyl, C_1-C_8 alkoxy, and fluorinated hydroxyalkyl having the structure $-(L^1)_{n1}-CR^8R^9-OH$ in which n1 is zero or 1, L^1 is C_1-C_6 aliphatic, R^8 is selected from hydrogen, C_1-C_8 alkyl, and fluorinated C_1-C_8 alkyl, and R^9 is fluorinated C_1-C_8 alkyl;

R^2 is hydrogen or C_1-C_8 alkyl;

R^3 , R^4, and R^5 are independently selected from hydrogen, C_1-C_8 alkyl, and fluorinated hydroxyalkyl having the structure $-(L^2)_{n2}-CR^{8A}R^{9A}-OH$ in which n2 is zero or 1, L^2 is C_1-C_6 aliphatic, R^{8A} is selected from hydrogen, C_1-C_8 alkyl, and fluorinated C_1-C_8 alkyl, and R^{9A} is fluorinated C_1-C_8 alkyl; and

further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{18} alicyclic group.

26. The method of claim 25, wherein:

R^1 is selected from hydrogen, C_1-C_4 alkyl, C_1-C_4 alkoxy, and $-(L^1)_{n1}-CR^8R^9-OH$ in which n1 is zero or 1, L^1 is C_1-C_4 aliphatic, R^8 is selected from hydrogen, methyl,

trifluoromethyl, difluoromethyl, and fluoromethyl, and R^9 is selected from methyl, trifluoromethyl, difluoromethyl, and fluoromethyl;

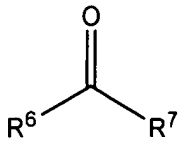
R^2 is hydrogen or C_1-C_4 alkyl;

R^3, R^4, and R^5 are independently selected from hydrogen, C_1-C_4 alkyl, and $-(L^2)_{n2}-CR^{8A}R^{9A}$-OH in which n2 is zero or 1, L^2 is C_1-C_4 aliphatic, R^{8A} is selected from hydrogen, methyl, trifluoromethyl, difluoromethyl, and fluoromethyl, and R^{9A} is selected from methyl, trifluoromethyl, difluoromethyl, and fluoromethyl; and

further wherein any two of R^1, R^2, R^3, R^4, and R^5 may be taken together to form a C_3-C_{12} alicyclic group.

27. The method of claim 26, wherein the olefinic reactant is selected from isobutylene, pinene, butenyl methyl ether, isopropenyl methyl ether, exo-2-methylene norbornane, 5-vinyl-2-norbornene, exo-methylene cyclopentane, and exo-methylene cyclohexane.

28. The method of claim 22, wherein the fluorinated carbonyl compound has the structure of formula (II)

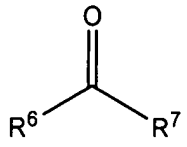
(II) 

wherein:

R^6 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_3-C_{25} acylmethyl, (fluorinated C_2-C_{24} acyl)-substituted methyl, (fluorinated C_2-C_{24} acyl)-substituted difluoromethyl, and -(CO)-R in which R is hydrogen, hydroxyl, halo, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, amino, C_1-C_{24} alkylamino, or di(C_1-C_{24} alkyl)amino; and

R^7 is C_1-C_{24} alkyl or fluorinated C_1-C_{24} alkyl, and further wherein R^6 and R^7 may be taken together to form a ring, with the proviso that at least one of R^6 and R^7 is fluorinated.

29. The method of claim 23, wherein the fluorinated carbonyl compound has the structure of formula (II)

(II) 

wherein:

R^6 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_3-C_{25} acylmethyl, (fluorinated C_2-C_{24} acyl)-substituted methyl, (fluorinated C_2-C_{24} acyl)-substituted difluoromethyl, and -(CO)-R in which R is hydrogen, hydroxyl, halo, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, amino, C_1-C_{24} alkylamino, or di(C_1-C_{24} alkyl)amino; and

R^7 is C_1-C_{24} alkyl or fluorinated C_1-C_{24} alkyl, and further wherein R^6 and R^7 may be taken together to form a ring, with the proviso that at least one of R^6 and R^7 is fluorinated.

30. The method of claim 29, wherein R^6 is selected from hydrogen, C_1-C_{24} alkyl, substituted C_1-C_{24} alkyl, C_3-C_{25} acylmethyl, (fluorinated C_2-C_{24} acyl)-substituted methyl, and (fluorinated C_2-C_{24} acyl)-substituted difluoromethyl.

31. The method of claim 30, wherein :

R^6 is selected from hydrogen, C_1-C_{12} alkyl, C_1-C_{12} haloalkyl, C_3-C_{13} acylmethyl, (fluorinated C_2-C_{12} acyl)-substituted methyl, and (fluorinated C_2-C_{12} acyl)-substituted difluoromethyl; and

R^7 is C_1-C_{12} alkyl or fluorinated C_1-C_{12} alkyl.

32. The method of claim 31, wherein :

R^6 is selected from hydrogen, C_1-C_8 alkyl, fluorinated C_1-C_8 alkyl, C_3-C_9 acylmethyl, (fluorinated C_2-C_8 acyl)-substituted methyl, and (fluorinated C_2-C_8 acyl)-substituted difluoromethyl; and

R^7 is C_1-C_8 alkyl or fluorinated C_1-C_8 alkyl.

33. The method of claim 32, wherein:

R^6 is selected from hydrogen, C_1-C_4 alkyl, semi-fluorinated C_1-C_4 alkyl, perfluorinated C_1-C_4 alkyl, and R^{12}-(CO)-$CR^{10}R^{11}$- in which R^{10} and R^{11} are H or F and R^{12} is methyl or trifluoromethyl; and

R^7 is selected from C_1-C_4 alkyl, semi-fluorinated C_1-C_4 alkyl, and perfluorinated C_1-C_4 alkyl.